

# **A THEORETICAL ASSESSMENT OF HIV/AIDS INTERVENTION STRATEGIES WITH SOME APPLICATION TO ZIMBABWE**

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# Abstract

HIV/AIDS is currently the leading cause of death globally and poses unprecedented threat to global health and human development. The most urgent public-health problem globally is to devise effective strategies to minimise the destruction caused by the epidemic. In this thesis we present a number of deterministic models for theoretical assessment of HIV/AIDS intervention strategies with particular attention to Zimbabwe. The HIV/AIDS models which are in the form of nonlinear delay differential equations are constructed via a progressive refinement of a basic model to incorporate more realistic features of HIV/AIDS pathogenesis and epidemiology such as staged progression, disease transmission by AIDS patients, sex structures, age structures and risk groups. Comprehensive analytic and numerical techniques are employed in determining stabilities, and assessing the effectiveness of each intervention strategy. Intervention strategies considered in this study are: (i) treatment with amelioration of AIDS patients in which change in sexual behaviour is defined by the sexuality of AIDS patients; (ii) a holistic approach of treatment, prophylactic vaccination with “take”, “degree” and “reduced infectiousness”, and condom use; (iii) the concurrent use of male and female condoms as a single-strategy approach in heterosexual communities; (iv) male circumcision as a potential preventive strategy of HIV/AIDS implemented jointly with male and female condom use in heterosexual settings; (v) the use of prophylactic antiretroviral drugs to reduce mother-to-child transmission (MTCT) and the effects of breastfeeding on MTCT in heterosexual settings with high HIV prevalence; (vi) the use of public health educational campaigns to control the epidemic among heterosexuals. We make conclusions based on the results acquired from the assessment of each intervention strategy.